Analysis of Regional Economic System in China(中国における地域経済システムに関する研究)

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論　文　内　容　要　旨

Introduction

Recent Chinese economic development has two main features : rapid economic growth of the national economy and widening interregional disparity. Interregional economic disparity is becoming a serious problem brought about partly by historical events in Chinese regional development, such as different development strategies in different periods, and the different natural characteristics of each region. Economic reform has especially changed the Chinese regional economic structure, sped up the development of the regional economy, and enlarged interregional economic disparity. In this paper, we carry out an econometric analysis of the Chinese regional system to discover the causes of and the remedies for interregional disparity, and to investigate the relation between the regional systems and the national economy in China.

Chinese regional economic system

We grouped Chinese industry into six sectors : i. e., Agriculture, Manufacturing, Constructions, Transportation, Commerce and Service. China is divide into seven regions : that is, Huabei, Dongbei, Huadong, Huanan, Huazhong, Xinan and Xibei regions. Most of the data used for empirical analyses is obtained from *STATISTICAL YEARBOOKS OF CHINA, 1985-1995.* All of the regional and sectorial data cannot be obtained from *Statistical Yearbooks*, thus we resorted to other data soureces as well.

● Economic disparity between coastal and inland areas

In all six industries, per capita output is larger in the coastal region. In four industries, the ratio of per capita output in the coastal region to that of the inland region is about 2.0.

● Economic disparity among seven regions

The largest disparity has occurred in the manufacturing sector, and the disparity in the agriculture sector is the least.

Analysis of production function in the Chinese regional system

● Specification and estimation of regional production

At first, the following Cobb-Douglas type function was applied.

$$Y_{ri}(t) = A_{ri} \cdot L_{ri}^{\alpha_{ri}}(t) \cdot K_{ri}^{\beta_{ri}}(t) \qquad (1)$$
$$\alpha_{ri} + \beta_{ri} = 1$$

A typical variation of the specification for (1) which was finally adopted, is in the following form.

$$Y_{ri}(t) = A_{ri} L_{ri(t)}^{\alpha_{0ri} + \alpha_{1ri} \ln K_{ri}(t)} \qquad (2)$$

● Test of technological difference in production

T-test and F-test for regional production functions among coastal and inland regions are applied to test whether there is a difference in production technology between the two regions in each industry. At the 1 % level, the hypothesis of the identical technology was not rejected.

● Estimation of production function at seven-region level

For each pair of regions and industries, the best model was selected from the viewpoint of coefficients' significance and the model's goodness-of-fit. Model (1) or (2) is adopted in many cases while model (1) fitted best in some cases including the manufacturing sector in all regions.

Simulation analysis on the basis of hypothetical capital stock allocation

In order to find the relationship between regional capital stock allocation and interregional disparity, three scenarios are simulated .

● Three alternative scenarios

Scenario 1 : Capital stock is allocated in proportion to regional population.

$$\hat{K}_{ri(t)} = K_i(t) \times \frac{POP_r(t)}{\sum_s POP_s(t)} \qquad (3)$$

$$i = 1, \ldots, 6; r = 1, \ldots, 7; t = 1985, \ldots, 1993$$

Scenario 2 : The growth rate of capital stock in each sector is the same among the regions.

$$\hat{K}_{ri(t)} = K_i(t) \times \frac{K_{ri}(1985)}{K_i(1985)} \qquad (4)$$

$$i = 1, \ldots, 6; r = 1, \ldots, 7; t = 1985, \ldots, 1993$$

Scenario 3 . Capital stock is allocated proportionally to regional output.

$$\hat{K}_{ri(t)} = K_i(t) \times \frac{Y_{ri}(t)}{\sum_s Y_{si}(t)} \qquad (5)$$

$$i = 1, \ldots, 6; r = 1, \ldots, 7; t = 1985, \ldots, 1993$$

For each region, the hypothetical allocations are compared with the actual ones. The results show that different regional capital stock level can lead to different regional output and form interregional disparity.

Equity versus efficiency

From the comparison of GDP size among the four cases for each year at national level, the following ordering holds except for 1986.

Scenario 3 > Scenario 2 > actual situation > Scenario 1

Simulated results show that allocating capital stock according to regional capital productivity is a more efficient way in that it brings about larger GDP. GDP is the smallest when capital stock is allocated in proportion to population.

Simulated results show that for the coefficient of variation of per capita output among the seven regions, (i.e., the extent of inequality among regions) the following ordering holds true among the four cases.

Scenario 2 > Scenario 3 > actual situation > Scenario 1

Analysis of investment behavior of China's regional system

Following Crow (1979), an econometric model is specified on the basis of the two-stage decision hypothesis of investment. First, national investment is determined for each industry, and then it is allocated among regions depending on their relative advantages. Since capital is mobile among regions, the two-stage decision hypothesis is plausible if the investment made by firms whose products are traded in national market is prevailing in total investment, typically, in the manufacturing sector. In the agriculture and construction sectors, most regional outputs may be traded in their own regions. However, throughout the analysis, it is assumed that the two-stage decision hypothesis is applied in all the industries.

● National investment behavior (First stage)

In the first stage, the basic models are based on the Capacity-acceleration principal, simple acceleration principle, and Profit principle. The results show that the capacity-acceleration type fitted best in the agricultural, construction, manufacturing, and service industries ; the simple acceleration type in the commerce sector ; and the profit principle type in the transportation sector.

● Regional investment behavior (Second stage)

In the second stage, the amount of national investment in each industry is allocated among regions, depending on the relative advantage. In commerce and service sectors, the size of the market is an important factor. In most sectors, labor productivity difference is an important factor.

Final test of the regional economic model

In order to evaluate the performance of this econometric model as tracing the regional economic system in China, the final test of the model is carried out. Mean Absolute Percentage Error (MAPE) for each endogenous variable Z, is difined as

$$MAPE=\frac{1}{T}\sum_{t=1}^{T}\left|\frac{\hat{Z}_t-Z_t}{Z_t}\right|\times 100\%. \qquad (6)$$

Since a relatively large error is associated with the estimation of regional investment in the commerce and service industries, the error ratio is small in the manufacturing and agricultural industries, where output share in GDP is high. So the adopted structures of the model can be used for evaluating the effects of transportation system change and population (employment) distribution changes on the regional and national economy in China.

Improvement of regional transportation system and interregional economic disparity

We make some assumptions based on four different hypothetical cases of improvement in the regional transportation system to analyze interregional disparity's changes with regional transportation system improvement. We determine interregional time-distance with network method.

Based on the assumptions, we can make out new regional potential data, then obtain different regional investment levels under different cases by adding new potential data into previous regional investment functions.

From the simulated results, we can conclude that improvement of regional transportation system can improve

national output level, but it also increases interregional disparity. Improvement of transportation system is a better way to increase national and some regions' output level, but it is not the best way to decrease interregional disparity for the Chinese regional economic system.

Conclusion

From statistical analysis of the regional sectoral production function, it is concluded that there is no significant interregional difference in production technology. The simulated results indicate that the interregional inequity and the efficiency of the national ecconomy are greatly affected by the interregional allocation pattern of capital stock. The analysis also suggests an inverted-U shaped relation between the interregional inequality and the efficiency of the national economy, which is consistent with observations in the literature so far. The performance of the regional econometric model, whose major components are production function and investment function, is judged to be satisfactory if the model can be used for evaluating the effects of various policies on the Chinese regional economy. Transportation system is also one of the most important components that affect regional economic development strongly. The simulation analysis shows that national economic level is increased, but interregional disparity will be enlarged with improvement regional transportation system.

審 査 結 果 の 要 旨

中国の経済改革プログラムは1978年に開始されたが，それ以来中国経済は高い率で成長している。しかし反面，経済の地域間格差は拡大し，その改善が中国社会の重要な課題となっている。本論文は，中国における地域格差の要因とその処方を発見するために，中国の地域システムを計量経済学的に分析し，さらに中国の地域システムと国民経済との間の関係を研究したもので，全編9章より成る。

第1章は序論であり，中国の経済発展過程と地域政策について歴史的経緯がまとめられ，本研究の背景と目的が述べられている。

第2章は分析で用いられるデータの説明にあてられるが，特に中国では地域レベルでは体系的にデータの入手が困難な中で，種々の資料を駆使し計量分析に耐え得る時系列データを作成したこと自体，今後この分野での実証研究を促進させるという意味で大きな貢献である。

第3章では，変動係数によって，中国の沿岸部と内陸部間の格差および，7地域間の格差について，時系列分析が行われている。

第4章では，地域別・産業別生産関数が推定され，「生産技術の地域間差異が経済の地域間格差の主要因である」という仮説が統計的に検定される。その結果，農業部門以外では生産技術の地域間差異は存在しないという興味ある結論が導出されている。

第5章は，資本ストックの地域間配分を変化させるシミュレーションによって，地域間格差の変化と国民経済におよぼす影響を分析している。その結果，資本ストックの配分が地域間格差に有意な影響を与え，また，地域間格差と国民経済の効率性との間には，逆U字型の関係があることが明らかにされている。これは中国の地域格差の改善政策と，中国の国民経済と地域システムの関係についての重要な研究成果である。

第6章は資本ストックの地域間配分を決める上で重要な地域産業別投資関数の分析を行っている。その結果，「2段階決定仮説」に基づく投資関数が適合し，製造業と運輸産業では，既存のエネルギー資源への近接性が投資配分の重要な要因であることが明らかにされている。この結果は，特に中国の交通ネットワーク整備の評価について貴重な示唆を与えている。

第7章は，本研究で構築された地域計量モデルのパフォーマンスが評価され，種々の政策評価のためのシミュレーション分析に用いることが可能であると結論づけられる。

第8章は，中国の交通ネットワークの整備が経済の地域間格差におよぼす効果を，シミュレーションによって分析していくつかの興味ある結果を得ている。

第9章は結論である。

以上要するに，本論文は，中国の地域経済システムに関する本格的な計量分析であり，情報科学研究の発展に寄与するところが少なくない。よって本論文は博士（情報科学）の学位論文として合格と認める。